

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
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In the Matter of )

Revision of the Commission's Rules )

To Ensure Compatibility with )

Enhanced 911 Emergency Calling Systems )

CC Docket No. 94-102

RM-8143

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**PETITION FOR RECONSIDERATION AND CLARIFICATION OF THE  
MOBILE AND PERSONAL COMMUNICATIONS DIVISION OF THE  
TELECOMMUNICATION INDUSTRY ASSOCIATION**

**TELECOMMUNICATIONS INDUSTRY  
ASSOCIATION**

Jesse E. Russell  
Chair, TIA Mobile and  
Personal Communications  
Division

Eric Schimmel, Vice President  
Telecommunications Industry Association  
2001 Pennsylvania Ave. N.W.  
Suite 800  
Washington, D.C. 20006  
(202) 457-4990

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## EXECUTIVE SUMMARY

The Mobile and Personal Communications Division of the Telecommunications Industry Association ("TIA") hereby petitions for reconsideration of the Report and Order ("*R&O*") implementing regulations to ensure compatibility between wireless mobile networks and enhanced 911 ("E911") calling systems. The *R&O*, among other things, adopts rules requiring carriers to process and deliver mobile calls to public safety answering points ("PSAPs"), under certain conditions. The extent of carrier's obligations, however, depend upon whether a mobile transmits a "code identification," as defined by the *R&O*. The *R&O* also requires that carriers render wireless systems compatible with text telephone devices ("TTYs") for E911 calls and sets out automatic location identification ("ALI") requirements that will take effect in five years.

TIA supports the Commission's efforts to ensure compatibility between wireless networks and E911 calling systems. With the recent explosion in demand for mobile phones, wireless systems have become an essential element in the country's public safety network. Ensuring the fullest technical extent of compatibility, therefore, has been a priority for both TIA and wireless carriers, independent of any regulatory obligations imposed by the Commission. Indeed, even today, carriers are already passing basic 911 calls to E911 systems, including, to the best of their ability, mobile identification numbers ("MINs").

As discussed below, however, some mobile systems are subject to technical limitations affecting their ability to meet the requirements set forth in the *R&O*. In general, there are no insurmountable technical problems with delivering basic 911 calls from compatible mobile

units to PSAPs without any processing. However, full compliance with the *R&O* requires that carriers provide certain information, such as call-back numbers, that are not always available. That is not to say that accurate information cannot be provided in some cases; only that there is no guarantee of accuracy based upon the *R&O*'s definition of "code identification," and, in particular, the definition's reliance on cellular MINs.

To clarify and refine the Phase I obligations of wireless carriers, TIA therefore suggests deleting the definition of MIN and:

*TIA recommends that "Code Identification" be defined as "The number used by a mobile station to identify itself to a network to obtain service."*

*TIA recommends that the Commission clarify its intent to prescribe only those validation procedures associated with billing of subscriber calls.*

*TIA recommends that the FCC clarify that, in cases where a mobile's directory number is not known to the serving carrier, the serving carrier's Phase I E911 obligations extend only to delivering 911 calls to PSAPs, if the unit is capable of originating calls without registration, and that implementation of other E911 functionalities for such mobiles is not required.*

TIA also notes that the *R&O* makes certain assumptions regarding how carriers can pass call-back information using the automatic number identification ("ANI"), based upon certain pseudo-ANI ("pANI") implementations. However, TIA believes that the specific definition of pANI requires the use of a particular implementation that may not be appropriate in all circumstances. Accordingly:

*TIA recommends defining "Pseudo Automatic Number Identification" as "A number, consisting of the same number of digits as Automatic Number Identification (ANI), that is not a North American Numbering Plan telephone directory number and may be used in place of an ANI to convey special meaning. The specific meaning assigned to the pANI is determined by agreements, as necessary, between the system originating the call, intermediate systems handling and routing the call, and the destination system."*

In addition, TIA urges the FCC to reconsider the compliance requirements for TTY/E911 compatibility set forth in the *R&O* with respect to digital systems. At the present time, the vocoders used in digital mobile systems do not reproduce well the signaling tones used by TTYs employing traditional IA2 signaling. While there are potential avenues for achieving functional equivalency by using existing data transmission schemes built into digital network protocols, modification of the existing base of vocoders does not appear either technically possible or readily achievable. Therefore:

*TIA urges the Commission to provide flexibility in its regulations to implement TTY/digital wireless E911 compatibility through the use of functional equivalents and to defer its requirement for TTY compatibility until after standards have been developed and a reasonable implementation timeframe can be discerned.*

As a final matter, TIA urges the Commission to reconsider aspects of the ALI requirements in the *R&O*. Specifically, inasmuch as the ALI technologies available today have not been subjected to the rigors of testing in a wide range of environments (*e.g.*, rural and dense urban) and under a wide range of conditions (*e.g.*, high vehicular speeds or in-building), TIA believes it is premature to adopt a percentage requirement for accuracy. While TIA believes the goal of 125 meter accuracy is achievable in certain cases, the accuracy of ALI systems will depend upon many technical factors that are not yet fully explored. Accordingly:

*TIA recommends that industry committees should be charged with examining the range of factors involved in assessing the performance of a ALI system to achieve a metric for measuring performance that is either (i) implementation and environment independent or (ii) allows consideration of environmental effects and provides some empirical means for assessing those effects for a given implementation. TIA thus recommends modifying Section 20.18(e) to replace the language "within a radius of 125 meters using root mean square techniques" with "within a radius of 125 meters using measurement and compliance procedures as determined by industry standards groups."*

As a final matter, TIA also notes that, with respect to ALI systems, requiring specification of results in terms of latitude and longitude may unnecessarily inhibit the development of systems employing "universal transverse mercator" coordinates desired by some PSAPs. Thus:

*TIA recommends that the words "by longitude or latitude" in Section 20.18(e) should be struck or should be modified to read "by longitude or latitude or equivalent."*

With these limited changes, TIA believes that the compatibility of E911 calling systems and wireless networks will be enhanced to the limit technically achievable. Carriers can, in many cases, achieve the full extent of compliance sought by the Commission. In specifying compliance by rule, however, the *R&O* seeks to require all systems to meet the same standard, regardless of technical differences in various mobile implementations. Under the circumstances, the modifications and clarifications sought by TIA should be adopted upon reconsideration.

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Revision of the Commission's Rules	)	CC Docket No. 94-102
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**PETITION FOR RECONSIDERATION AND CLARIFICATION OF THE  
MOBILE AND PERSONAL COMMUNICATIONS DIVISION OF THE  
TELECOMMUNICATION INDUSTRY ASSOCIATION**

The Mobile and Personal Communications Division of the Telecommunication Industry Association ("TIA")<sup>1</sup> respectfully petitions for reconsideration and clarification of the above-captioned Report and Order.<sup>2</sup> While TIA supports the Commission's goal of ensuring compatibility between E911 calling systems and wireless services, TIA believes aspects of the *R&O* require clarification or modification. Specifically, TIA recommends that:

- The MIN definition be deleted and that "Code Identification" be defined as "The number used by a mobile station to identify itself to a network to obtain service."
- "Pseudo Automatic Number Identification" be defined as "A number, consisting of the same number of digits as Automatic Number Identification (ANI), that is not a North American Numbering Plan telephone directory number and may be used in place of an ANI to convey special meaning. The specific meaning assigned to the pANI is determined by agreements, as necessary, between the system originating the call, intermediate systems handling and routing the call, and the destination system."

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<sup>1</sup>The Telecommunications Industry Association is the association of telecommunications manufacturers. The Mobile and Personal Communications Division of TIA is comprised of four sections which address wireless cellular, PCS, private, and satellite issues.

<sup>2</sup>Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, CC Docket No. 94-102, FCC 96-264 (July 26, 1996) ("*R&O*").

- The Commission clarify its intent to prescribe only those validation procedures associated with billing of subscriber calls.
- The FCC clarify that, in cases where a mobile's directory number is not known to the serving carrier, the serving carrier's Phase I E911 obligations extend only to delivering 911 calls to PSAPs, if the unit is capable of originating calls without registration, and that implementation of other E911 functionalities for such mobiles is not required.
- The Commission should provide flexibility in its regulations to implement TTY/digital wireless E911 compatibility through the use of functional equivalents and defer its requirement for TTY compatibility until after standards have been developed and a reasonable implementation timeframe can be discerned.
- Industry committees should be charged with examining the range of factors involved in assessing the performance of a ALI system to achieve a metric for measuring performance that is either (i) implementation and environment independent or (ii) allows consideration of environmental effects and provides some empirical means for assessing those effects for a given implementation. TIA thus recommends modifying Section 20.18(e) to replace the language "within a radius of 125 meters using root mean square techniques" with "within a radius of 125 meters using measurement and compliance procedures as determined by industry standards groups."
- TIA recommends that the words "by longitude or latitude" in Section 20.18(e) should be struck or should be modified to read "by longitude or latitude or equivalent."

With these clarifications and modifications, the Commission's goal of achieving E911 compatibility with wireless systems will be realized to the fullest extent technically achievable.

**I. THE COMMISSION SHOULD RECONSIDER AND CLARIFY THE E911 PHASE I REQUIREMENTS**

**A. The Definitions for Phase I Implementation Should Be Revised To Be Consistent With Current Technical Signaling Implementations**

The Phase I requirements set forth in the *R&O* require covered wireless carriers to pass certain subscriber information to the Public Safety Answering Point ("PSAP") to assist in



identifying callers and ensuring the ability to reestablish a connection in the event the 911 call is interrupted. In order to implement these requirements, the *R&O* defines "code identification," "mobile identification number" ("MIN"), "automatic number identification" ("ANI"), and "pseudo ANI" ("pANI"). Due to differences in mobile signaling and access arrangements, however, these definitions raise a number of compliance questions. Below, TIA has attempted to revise the definitions to be consistent with the intent of the Commission's policies and, at the same time, to comport with current usage and planned developments.

**1. The Definition of "Code Identification" Should Not Be Dependent Upon the MIN**

When a mobile station accesses a wireless system, it must generally identify itself.<sup>3</sup> AMPS cellular phones originally used a 10-digit MIN, a number that is encoded on some air interfaces as 34 bits. In the beginning, the MIN was the same as a telephone directory number within the U.S. and Canada -- a North American Numbering Plan ("NANP") number. In the past several years, however, the MIN has become a true mobile identifier and may or may not be a telephone directory number. This evolution has accommodated originate-only mobiles, special marketing programs, international users (especially Mexico), and NPA (area code) splits within the US. Moreover, because the use of the MIN has been stretched to the limits, TIA standards committees are now recommending the use of an International Mobile Subscriber Identity ("IMSI"). Thus, the mapping of a mobile station identifier, whether a

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<sup>3</sup>In cases, basic E911 service has been implemented without any identification. However, as discussed below, mobile identification is necessary to provide E911 information required under the *R&O*.

MIN or IMSI, to a telephone directory number normally does not occur until the mobile station is validated by the wireless system.

The IMSI is the standard used by GSM-based systems, such as PCS1900. During validation, the IMSI is mapped to the Mobile Station Integrated Services Digital Network ("MSISDN") number, which is the telephone directory number. These systems also allow a mobile terminal to identify itself with an International Mobile Equipment Identifier ("IMEI"), whether or not the mobile is used with a Subscriber Identity Module ("SIM"); however, the IMEI is used for equipment validation purposes only and cannot be used to address the mobile. The presence of only the IMEI does not allow for enhanced emergency services. In other words, the absence of a SIM card precludes the possibility of supplying a call-back number.

Assuming that the air interface technology allows a mobile station to access a traffic channel, *basic* 911 service can be provided. Enhanced 911 services, however, require that the mobile station be *uniquely* identified. Without this unique identification, a PSAP cannot accurately retrieve personal information about the particular subscriber. Call-back also requires uniqueness to ensure that only one mobile is presented the call, and the right mobile is able to answer the call. Some location technologies may require uniqueness to ensure that the same mobile is being located, although these technologies may also use temporal considerations to eliminate most duplicate identifiers.

Indeed, without validation, unique identification of a mobile unit that uses an MIN is not even possible because the MIN is not unique. Some mobile manufacturers, for example, use a default MIN for programming purposes or for factory built automobile emergency phones. In other cases, a MIN assigned to one subscriber may be assigned to another when a

subscription lapses. Carriers may also inadvertently assign MINs that are duplicated by other carriers, especially international carriers, or intentionally assign the same MIN to more than one phone as part of an "extension phone" service offering. Finally, illegal clones may intentionally duplicate a MIN to access a valid subscription. While many of the "uniqueness" problems of the MIN are being addressed in the newer AMPS derivative technologies by using IMSIs, which have a larger number space and less possible overlapping, these developments will not guarantee MIN uniqueness for the current 40 million cellular mobiles in service today.

Under the circumstances, tying the *R&O* definition of "code identification" specifically to the MIN may be inadvertently limiting its scope of applicability. Instead, the definition of MIN should be deleted and the definition of Code Identification should be expanded to use whatever number is used to identify the mobile be it a MIN, IMSI, or any other identifier:

*Code Identification.* The number used by a mobile station to identify itself to a network to obtain service.

## **2. The pANI Definition Should Be Modified To Eliminate References To A Specific, Non-Standard Implementation**

ANI is a system for billing calls by indicating on a call the party responsible for paying for the call. Most of the time, the ANI is the directory number of the calling party, but it is not always. In emergency service applications, for example, the use of ANI is modified to identify the calling party and thus the ANI may be used as a call-back number. This may not be possible in all cases, however, for mobile implementations.

For several years, the industry has experimented with providing information to the PSAP using the ANI field of Centralized Automatic Message Accounting ("CAMA") signaling. CAMA, however, uses only a 7- or 8-digit ANI field. The number of digits is fixed by interconnection agreements between the interconnected systems. 8-digit ANI is used for locations serving more than one NPA (area code). Thus, ANI is sufficient for identifying landline telephones where a 7- or 8-digit ANI is used to identify the calling party (not the responsible party). For wireless applications, however, 7- and 8-digit ANI is useful for only local mobiles, since domestic roaming mobiles within the US require 10-digit ANI and international roamers require a 15-digit number.

The identification of the base station or cell site has been sent using pseudo-ANI or pANI. The pANI has the same number of digits as an ANI, but it does not use an assignable directory number. This allows the pANI numbers to be assigned without conflict to existing or future telephone numbers. The pANI can be used to convey various pieces of information to the PSAP or other network elements. The pANI, when encoded with the base station or cell site identification, may be used to access an Automatic Location Identification ("ALI") database to retrieve location information for the mobile caller. In some instances, the pANI has also been used to convey a temporary directory number for roaming subscribers.

The use of pANI to convey location information for wireless carriers assumes that there are no interLATA calls, no calls involving access tandems, no calls involving interexchange carriers, and no calls that must be interworked between MF and ISUP signaling. Unfortunately, these types of calls may be fairly common for some wireless carriers, especially those PCS carriers serving large areas that cover multiple LATAs and multiple

states. For these applications, the ANI should identify the calling party and the pANI should identify special circumstances of the calling party (such as a mobile subscriber that has not been validated or authenticated to obtain the mobile subscriber's true ANI). The called number field may then be used to carry the base station or cell site identification information. This minimizes the effect of providing the 911 service on other network elements, although it requires changes to the emergency service selective routers and PSAP equipment. TIA notes, however, that this equipment may have to be changed out in any event to accommodate larger ANI fields and simultaneous location information.

Under the circumstances, the definition of pANI in the *R&O* is not correct and implies a particular implementation that may not be desirable for many wireless carriers. Instead, TIA recommends an implementation-neutral definition of pANI.

*Pseudo Automatic Number Identification.* A number, consisting of the same number of digits as Automatic Number Identification (ANI), that is not a North American Numbering Plan telephone directory number and may be used in place of an ANI to convey special meaning. The specific meaning assigned to the pANI is determined by agreements, as necessary, between the system originating the call, intermediate systems handling and routing the call, and the destination system.

**B. Because Code Identifications Are Not Unique, Call-Back and Other E911 Functionalities Require a Validation Procedure**

The *R&O* requires that covered carriers, within one year, "must process all 911 calls which transmit a Code Identification and must process all 911 wireless calls which do not transmit a Code Identification where requested by the administrator of the designated

[PSAP]."<sup>4</sup> Moreover, the *R&O* states that "any person who attempts to place a 911 call through the facilities of a covered carrier will not be subject to any validation or similar carrier-initiated procedures that could result in a delay in the delivery of the 911 call to a PSAP."<sup>5</sup> As previously noted, however, *all* calls (with the exception of some *basic* 911 calls) require at least some database lookup (*i.e.*, a "validation") procedure to associate a telephone directory number with a particular Code Identification. TIA urges the Commission to clarify that such procedures are, in fact, consistent with its rules.

The intent of the validation prohibition in the *R&O* appears to be targeted at practices that require non-subscribers to provide a credit card number and have the credit card number validated prior to placing calls.<sup>6</sup> For obvious reasons, the Commission objects to interposing delays into emergency services calls. TIA is concerned, however, that this rule could be interpreted overbroadly to prohibit database and subscriber validation and authentication actions that are required to obtain telephone directory numbers to implement other aspects of the *R&O*. The *R&O* states, for example, that "[c]arrier switches will screen incoming calls from mobile units, determine whether a code identification is present, and then (if such a code

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<sup>4</sup>47 C.F.R. §20.18(b).

<sup>5</sup>*R&O*, ¶32.

<sup>6</sup>For example, the *R&O* seems to implicitly recognize that some lookup functions are performed by carriers where it notes that "[validation] information is available if a carrier receives a 911 call from a person in one of the two groups covered by the rule proposed in the Notice -- *i.e.*, from one of its own subscribers, or from subscribers of other carriers with whom it has roaming agreements and shares roaming databases. In such instances, validation information typically is provided automatically by reference to these databases." *R&O*, ¶31.

is present) immediately route the call to a PSAP without any further call screening."<sup>7</sup> With TIA's clarification of the code identification definition, it is apparent that there is no way of "immediately rout[ing]" calls if caller identification and other information required by the *R&O* is to be provided. Thus:

*TIA recommends that the Commission clarify its intent to prescribe only those validation procedures associated with billing of subscriber calls.*

**C. The FCC Should Clarify Carriers' Phase I Obligations With Respect To "Non-Service Initialized" Mobiles**

The *R&O* requires that covered carriers process 911 calls from all interface-compatible mobile units, whether or not service-initialized. This departs from the original proposal in the October 1994 NPRM, which required only that carriers process 911 calls from service-initialized handsets. As discussed below, however, while 911 calls from non-service initialized handsets can generally be passed to the PSAP, there are aspects of the E911 requirements that are technically infeasible for non-service initialized mobiles.

The October 1994 NPRM proposal for transmitting E911 calls to designated PSAPs provided complex technical challenges to the wireless industry. In TIA's work with the CTIA, NENA, APCO and NASNA, many technical problems were eliminated when the parties agreed that "911 service would be available to any handset that is service-initialized."<sup>8</sup> This

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<sup>7</sup>R&O, ¶34.

<sup>8</sup>See Joint Experts Meeting Report, Telecommunications Industry Association (August 1994); Joint Experts Meeting Report, Telecommunications Industry Association, Association of Public Safety Communications Officials International, Inc., National Association of State

solution met the emergency service community's requirements, alleviated some of the technical challenges particular to wireless communication, simplified the overall solution, and achieved a balance with the emergency services provided by land line carriers.<sup>9</sup>

The *R&O* fundamentally alters the technical basis for TIA's work to date. Indeed, not every mobile using a compatible air interface can even complete a 911 call through a wireless carrier. Some non-cellular mobile units, for example, have internal programming that precludes dialing any number unless the unit has registered with a service provider. In those cases, reprogramming of the entire installed base of mobiles would be required to comply with the Commission's rules. Given the Commission's well-founded preference for switch-based, rather than mobile-based, solutions to E911 compatibility, these units should be grandfathered under the prior regulations.<sup>10</sup>

Even if a mobile unit is air interface-compatible with a wireless carrier and can originate a 911 call, some of the E911 functionalities simply cannot be provided. As an initial matter, some mobile units are electronically designed as originate-only; for these units no call-

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Nine-One-One Administrators, National Emergency Number Association, Personal Communications Industry Association (November 1994); Consensus Agreement, Cellular Telecommunications Industry Association, Association of Public Safety Communications Officials International, Inc., National Association of State Nine-One-One Administrators, National Emergency Number Association (February 1996).

<sup>9</sup>The additional complexity required to support invalidated mobiles is an additional requirement for wireless carriers that land line carriers do not have. Even when a land line carrier must support "soft dial tone" service, they can still trace a call to a particular phone.

<sup>10</sup>See, e.g., *R&O*, ¶¶41-42 (discussing implementation of PIN override for 911 access at the switch level, rather than at the handset level, grandfathering older handsets, and encouraging development of future handsets with override capabilities).



back number can be provided. Similarly, other units, while electronically capable of receiving calls, may not be associated with a dialable telephone number at all -- the mobile could be offered by a service provider under an originate-only rate plan, may be brand new and never initialized, or may have once had a service subscription that has lapsed. In these cases, no means of achieving compliance with the call-back aspects of the order appear to be technically feasible.

Indeed, even if a mobile unit is capable of receiving calls and has a valid dialable telephone line number, a carrier may not be able to ensure that it is providing a correct or valid directory number for the unit. As previously noted, a carrier cannot ensure that it is providing a dialable telephone number for a mobile unless there is an entry in the carrier's database that translates the unit's code identifier to a telephone number. These entries exist only in cases where a mobile is operating in its home system or in a system that has a roaming agreement with the mobile's home system, or where the mobile has previously registered with the system. For example, assume a cellular user subscribed to system *A* is currently located in the service area of system *B*. If system *A* and system *B* do not have a roaming agreement, and the user has not registered its presence with system *B*, system *B* has no way of associating the user's MIN (or Code Identifier) with a dialable telephone number. That being said, however, in the case of *analog* cellular phones, the MIN happens, in *some* cases, to be the directory line number; this number could be provided to PSAPs.

Similar concerns also may apply to other E911 functionalities. Some ALI systems, for example, may require unique code identifiers to accurately position the units. For the same reasons that code identifiers cannot be associated with telephone numbers, the carrier cannot

necessarily guarantee uniqueness. Given that these ALI systems have not been fully developed, some flexibility with respect to compliance for non-service initialized handsets may be warranted.

Given the new technical direction of the *R&O*, and the confusion surrounding the Commission's definitions, clarification of the obligations of carriers with respect to non-service initialized handsets is warranted. Specifically:

*TIA recommends that the FCC clarify that, in cases where a mobile's directory number is not known to the serving carrier, the serving carrier's Phase I E911 obligations extend only to delivering 911 calls to PSAPs, if the unit is capable of originating calls without registration, and that implementation of other E911 functionalities for such mobiles is not required.*

## **II. THE COMMISSION SHOULD CLARIFY AND RECONSIDER THE TTY ACCESS REQUIREMENTS FOR E911 COMPATIBILITY WITH DIGITAL MOBILE RADIO SYSTEMS**

The *R&O* requires that, no later than one year after the effective date of the rules, covered carriers "must be capable of transmitting 911 calls from individuals with speech or hearing disabilities through means other than mobile radio handsets, *e.g.*, through the use of Text Telephone Devices."<sup>11</sup> In the text of the *R&O*, the Commission urges industry bodies to "establish standards that will permit interfaces between TTYs and wireless systems,"<sup>12</sup> before the end of this calendar year. While TIA supports 911 access from text telephone devices ("TTYs"), TIA is concerned that the specific requirements of Section 20.18 relating to TTYs

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<sup>11</sup>47 C.F.R. §20.18(c).

<sup>12</sup>*R&O*, ¶51.

may not be achievable within the timeframe contemplated by the Commission for digital radio systems.

Modern digital wireless telephones incorporate vocoders that process received and transmitted speech. At a simplistic level, the encoding consists of subdividing the speech input into time segments and applying a mathematical model of the human vocal tract to derive a set of parameters matching the speech input for each segment. In decoding, the processor applies the same model of the human vocal tract in reverse, reconstructing the original speech from the transmitted parameters. The output of this process is a fairly accurate representation of the input speech, insofar as human perceptions are concerned. This technique permits the maximum spectral efficiency by eliminating redundant speech parameters. These techniques, however, are not "waveform-following" techniques used in traditional narrowband FM cellular telephone systems.

The difficulty in transmitting TTY information over digital wireless systems is that the traditional IA2 TTY system is not well reproduced by a system designed to model the human vocal tract. Thus, the quality of the output of a TTY signal through a modern vocoder will vary depending on the particular type of vocoder used (*e.g.*, GSM-based systems such as PCS1900, IS-54/IS-136, or IS-95), but the results will be similar -- corruption of the signal on symbol-to-symbol transitions and inaccurate rendering of the symbol waveform within the symbols. Whether an individual TTY link will function properly under these circumstances will then depend upon the tolerance of the receiving TTY unit to these effects. TIA thus does not believe that reliable TTY communications can be guaranteed through a modern vocoder.

Moreover, the current TTY requirements appear to extend compatibility requirements beyond what Congress intended in enacting Section 255. As the Commission itself observes, Section 255 requires compatibility "if readily achievable."<sup>13</sup> Based upon the current development of vocoder technology, modification of wireless systems to achieve a usable interface with TTY devices does not appear "readily achievable." Indeed, even in Section 225, where Congress directed the development of Telecommunications Relay Services for TTY devices, Congress required only such services be deployed "to the extent possible,"<sup>14</sup> and, in fact, Congress mandated that "[t]he Commission shall ensure that regulations prescribed to implement this section encourage, consistent with section 157(a) of this title, the use of existing technology and do not discourage or impair the development of improved technology."<sup>15</sup> The *R&O*'s adoption of measures requiring compatibility between TTY devices and wireless mobile telephones effectively reads these requirements out of the Act.

While TIA believes solutions to TTY/wireless compatibility are possible, TIA does not believe that alteration of vocoder standards is the optimal means of guaranteeing reliable communications. Instead, TIA believes the best alternative to acoustic coupling of TTY signals through a vocoder would be direct teletext service through the mobile unit's display and keypad (or a full keyboard extension).<sup>16</sup> The communications over the radio link would be

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<sup>13</sup>*R&O*, ¶47 (citing 47 U.S.C. §255).

<sup>14</sup>47 U.S.C. §225.

<sup>15</sup>47 U.S.C. §225.

<sup>16</sup>Such a solution would also eliminate problems associated with the geometry of wireless handsets not matching the acoustic couplers used with standalone TTY devices.

provided by protocols defined within existing wireless system standards for text communications (either short message service, or data services), and the PSTN interface would provide the translation to and from TTY for the landline end of the link. This solution would provide maximum benefits to the end user (*i.e.*, reliable TTY communications) without requiring a standalone TTY unit in addition to the mobile phone. Indeed, for some systems, the low baud rate on the channel (and associated cost advantages) might promote the usage of this function beyond the community of individuals with hearing and speech disabilities.

Under the circumstances, TIA believes the Commission's rules should explicitly provide for achieving TTY compliance without requiring compatibility between TTY protocols and digital wireless air interfaces. Even with this clarification, TIA believes more than one year may be necessary to achieve compliance.<sup>17</sup> Even if industry groups are able to develop standards by the end of this calendar year, which would be a herculean task, implementing those standards in the remaining time would likely be impossible. Accordingly:

*TIA urges the Commission to provide flexibility in its regulations to implement TTY/digital wireless E911 compatibility through the use of functional equivalents and to defer its requirement for TTY compatibility until after standards have been developed and a reasonable implementation timeframe can be discerned.*

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<sup>17</sup>In this regard, TIA suggests that the Commission may wish to employ the reporting obligations it imposed on the Consensus Agreement signatories relative to other TTY compatibility requirements. See *R&O*, ¶52 & n.81.

**III. THE COMMISSION SHOULD RECONSIDER AND DEFER MANDATING ACCURACY AND COMPLIANCE MEASUREMENT STANDARDS FOR AUTOMATIC LOCATION IDENTIFICATION UNTIL AFTER INDUSTRY HAS COMPLETED IMPLEMENTATION INVESTIGATIONS**

The Phase II implementation mandated by the *R&O* requires covered carriers to provide, within five years of the effective date of the rules, the location of a 911 call by longitude and latitude within a radius of 125 meters in 67 percent of the cases using root mean square techniques.<sup>18</sup> While TIA is hopeful that manufacturers develop technology to meet the deadline established by the Commission for ALI implementation within a radius of 125 meters, TIA believes that its premature to specify either the accuracy or a compliance scheme for ALI. In particular, TIA believes the Commission should reconsider its 67 percent threshold until industry committees have assessed the implementation of 125 meter radius ALI in a variety of environments under different conditions.

As an initial matter, the five year implementation deadline for ALI was based on the Commission's assessment that "the equipment manufacturers believe a five-year deadline is achievable."<sup>19</sup> At least one of the three cited commenters, however, stated explicitly that "given the unpredictability of technological developments, [it] cannot in good faith assure the Commission that it can meet this schedule."<sup>20</sup> The majority of manufacturers commenting in

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<sup>18</sup>47 C.F.R. §20.18(e).

<sup>19</sup>*R&O*, ¶68.

<sup>20</sup>Comments of Motorola, Inc. (CA) at 6-8.

this proceeding, in fact, believed a five year deadline was excessively optimistic.<sup>21</sup> As discussed below, this reservation is, in part, motivated by the need to test ALI technologies to determine performance in a variety of circumstances, ranging from urban to rural, stationary to rapidly moving, and in-building and outdoor conditions. Because the ability to provide reliable and accurate ALI in the full range of mobile environments is under investigation, mandating a 67 percent accuracy at this time is premature.

For example, at the present time, terrestrial<sup>22</sup> ALI technologies attempt to "triangulate" on particular mobile units by measuring time difference of arrival ("TDOA") of a transmission at two additional base stations from the station being used for the voice link (*i.e.*, 3 total) or direction of arrival ("DOA") at one additional base station from the station being used for the voice link (*i.e.*, 2 total).<sup>23</sup> Using these technologies, a minimum of two base stations are needed to determine a mobile position in two dimensions under ideal circumstances. This is not an "accuracy" issue whereby the second station provides additional refinement of an initial estimate; rather, it is a principle of mathematics required to define a point on a plane. Simply

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<sup>21</sup>*See, e.g.*, Comments of Motorola, Inc. (CA) at 6-8, Comments of Northern Telecom, Inc. (CA) at 4-6. ALI technology has been a priority for wireless manufacturers for a long time. Carriers have continually requested reliable ALI systems in order to implement a wide variety of new services, including location tracking for route mapping, zone-based rate plans, and services providing information on the nearest available gas station, hospital, etc. ALI technology is highly valuable to carriers, and therefore accurate ALI systems are being developed as fast as possible by manufacturers independent of any E911 requirements.

<sup>22</sup>Given the cost, current drain, and antenna design issues associated with integrating GPS receivers into portable wireless devices, GPS integration does not appear to be feasible for ALI.

<sup>23</sup>Although systems using other characteristics (*e.g.*, received signal strength) have been proposed, these proposals have not been considered credible.

put, if two receivers cannot measure the mobile's signal, ALI cannot be provided using DOA and if three receivers cannot measure the mobile's signal, ALI cannot be provided using TDOA. Thus, regardless of accuracy, a mobile may not be able to establish a clear link to the necessary number of receivers in 67 percent of all cases. Indeed, some rural systems and smaller dispatch systems may not even have the requisite number of receivers to provide position fixes at all.

Beyond these fundamental limitation, there are also accuracy limitations owing to the technological capabilities of today's systems that must be overcome. First, to achieve reasonable accuracy, the triangulation signal must not be "correlated" with any co-channel interference received by the base station; correlated interference produces uncertainties that may be very difficult to overcome through multiple measurements and averaging. Second, radio signals suffer from multipath effects that must be separated out to achieve reasonable accuracy. Unfortunately, there is a limit on a receiver's ability to differentiate between a true "line-of-sight" signal and a reflection, which results in minimum resolvable time differences that translate into path length differences measured in miles. Indeed, there are cases where no "line-of-sight" signal even exists, which means that ALI systems will provide wrong locations that, without further characterization, would be considered unacceptable. Furthermore, the geometry of the base station layout can also affect the performance of an ALI system, even if sufficient receivers exist to nominally achieve a location reading.

Unfortunately, mobile transmitters operate in a wide variety of environments that can affect all of these performance factors. Operation in rural areas, for example, may provide clear line of sight to multiple transmitters, but may be complicated by excessive distances. In



urban environments, propagation paths may be shorter, but the presence of signals reflected from structures complicates achieving accurate results. Operation of a mobile at high speeds, or inside buildings, can also produce "fades" or cause attenuation that affects the performance of an ALI system, notwithstanding the inherent issues surrounding accuracy impacts of measurement time latency involved with locating moving radios. Moreover, the accuracy of the position fix can be affected by the accuracy of the data regarding the location of the base stations, translations between different coordinate systems, the air interface protocols, and even by the protocols used to send position information to the PSAP.

Under the circumstances, TIA does not believe that a single, static 67 percent accuracy threshold is necessary or desirable. Instead:

*TIA recommends industry committees should be charged with examining the range of factors involved in assessing the performance of a ALI system to achieve a metric for measuring performance that is either (i) implementation and environment independent or (ii) allows consideration of environmental effects and provides some empirical means for assessing those effects for a given implementation. TIA thus recommends modifying Section 20.18(e) to replace the language "within a radius of 125 meters using root mean square techniques" with "within a radius of 125 meters using measurement and compliance procedures as determined by industry standards groups."*

As TIA suggested relative to TTY/digital wireless system compatibility, such industry committees report the progress of standards-setting discussions at the time the Consensus Agreement participants file their report with the Commission.<sup>24</sup>

Finally, TIA also believes that Section 20.18(e) may be too specific in requesting latitude and longitude. TIA TR45.2 has been requested to study the ability to use Universal

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<sup>24</sup>See R&O, ¶52.